SAMPLING AND ANALYSIS PLAN

BAYONNE BARREL AND DRUM SITE

NEWARK, ESSEX COUNTY, NEW JERSEY

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Prepared for:

United States Environmental Protection Agency
Region II - Removal Action Branch
Edison, New Jersey

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NEWARK, ESSEX COUNTY, NEW JERSEY

1. PROJECT NAME: Bayonne Barrel and Drum Site
   Newark, Essex County, New Jersey

2. PROJECT REQUESTED BY: Joseph Cosentino, On-Scene Coordinator
   USEPA Removal Action Branch

3. DATE REQUESTED: November 15, 1994

4. DATE OF PROJECT INITIATION: November 29, 1994

5. PROJECT ORGANIZATION AND RESPONSIBILITY

The following is a list of key project personnel and their corresponding responsibilities:

Joseph Cosentino, On-Scene Coordinator, USEPA Region II

Mark A. Denno, Roy F. Weston, Inc., TAT Project Manager

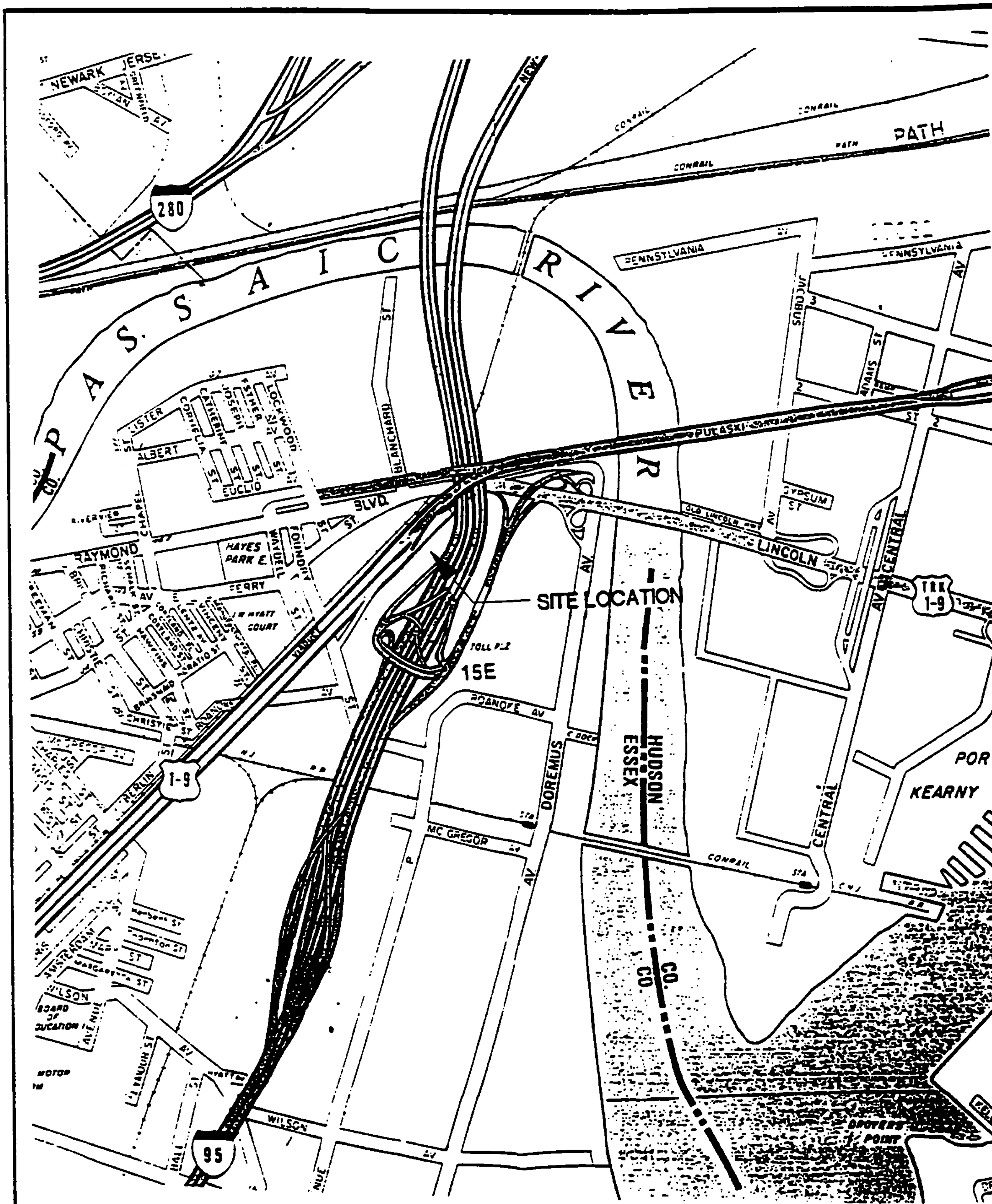
Smita Sumbaly, Quality Assurance/Quality Control (QA/QC) Officer

6. PROJECT DESCRIPTION

A. Site Description

The Bayonne Barrel and Drum Site (BB&D) is a former drum reconditioning facility occupying approximately 15 acres off Raymond Boulevard in the Ironbound section of Newark, New Jersey (see Figure 1). The facility operated as an unlicensed Treatment, Storage, and Disposal (TSD) facility from the early 1940's until the early 1980's when the company filed for bankruptcy under Chapter 11. The site is bordered to the north and west by Routes 1 and 9, to the east by the New Jersey Turnpike and to the south by a movie theater.

Operations by Bayonne Barrel and Drum included incineration of open-head drums as a part of the reconditioning process. The drums, after incineration, were either sold or stored in the southwest end of the site. It is estimated that approximately 45,000 of these "RCRA empty" drums are currently located on-site. However, during the removal of these drums, it has been determined that most of the drums are not RCRA empty, but in fact still contain various unknown liquid products. In addition, the otherwise empty drums have been subjected to weather conditions for approximately eight years, resulting in oxidized drums and the infiltration of rainwater into many of the drums through their bung holes or rusted parts.



WESTON	Roy F. Weston, Inc. MAJOR PROGRAMS DIVISION	EPA PM J. Cosentino	Site Location
	IN ASSOCIATION WITH FOSTER WHEELER CORP., C.C JOHNSON & MALHOTRA, P.C., RESOURCE APPLICATIONS, INC. AND R.E. SARRIERA ASSOCIATES	TAT PM M. Denno	Figure 1

B. Laboratory

TAT solicited bibs three local laboratories for TCL analysis with the awarded laboratory being Accredited Laboratories, Inc. (Carteret, New Jersey) based on lowest bidder. An EPA QA/QC level 2 is required for this project.

C. Objective and Scope

Sampling objectives include waste characterization of residual drum products and surface soil under the existing drum piles. Only drums with known generator hazardous waste labels will be sampled.

Twelve (12) residual product drums will be sampled and analyzed for Target Compound List (TCL) if single phase and matrix, otherwise, less drums will be sampled. Six (6) drums will consist of a solid/sludge matrix and six (6) drums will consist of a liquid/aqueous matrix.

Six (6) discrete judgemental soil samples will be taken throughout the drum piles and sampled for TCL. Worst case scenario and biased sampling will be performed at known hot spots (i.e. soil piles, standing product, and under leaking drums). Sample locations will be determined by the OSC and delineated with stakes for reproducibility.

D. Data Usage

The data generated from this sampling and analyses project will be used to characterize potential responsible party (PRP) drums and determine if residual drum products are acutely toxic or contributing to the existing soil conditions on-site. Chemical compounds identified will be used to evaluate PRP attributability for cost recovery.

E. Sampling Analysis

Sample Parameter/ Fraction	Matrix	Analytical Method Reference	Holding Time (Days)	Volume	Preservation
TCL					
VOLATILES	Soil	8240	10	2 X 120ml	Cool to 4C
(VOA)	Aqueous	624	10	2 X 40ml	pH<2 HCL
	Liquid	8240	10	incl. w/extr.	none
SEMI-VOLATILES	Soil	8250	10	1 X 8 oz.	none
(BNA)	Aqueous	625	5	4 X 1 L Amber	Cool to 4C
	Liquid	8250	10	1 X 8 oz.	none
PCB/PEST	Soil	8080	10	incl. w/extr.	none
	Aqueous	608	5	incl. w/extr.	Cool to 4C
	Liquid	8080	10	incl. W/extr.	none

NOTE: 1. Sample preparation methods for TCL fractions; SW-5030 (VOA) and SW-3510/3540 (BNA/PEST/PCB)

7. SAMPLING PROCEDURES:

Soil sampling will consist of collecting six discrete samples, 0-6 inches in depth, at various locations determined by the OSC, from the soil formerly located beneath the drum piles. The area is targeted by EPA for surficial soil excavation to stabilize the site.

All samples will be collected using stainless steel trowels to a depth of six inches. Samples to be analyzed for the BNA/PCB/Pesticide fractions of TCL analysis will be homogenized in disposable aluminum baking pans, and a representative sample will be collected from the resulting mixed volume for laboratory analysis. Samples to be analyzed for the volatile fraction of TCL analysis will remain discrete samples. Decontamination of sampling apparatus between sample locations is necessary since all sampling equipment is not disposable.

Six (6) liquid and six (6) sludge product samples will be collected from twelve (12) drums formerly contained within the RCRA empty drum piles or within the overpacked and staged drum area. Dedicated sampling equipment includes glass drum thieves and coliwasas. Decontamination of sampling apparatus between sample locations is not necessary since all sampling equipment is disposable.

All sampling will be conducted in accordance with applicable EPA Standard Operating Procedure (SOP). A copy of the soil and drum sampling protocol SOPs are attached as Appendix A and B respectively. Drum sampling will be conducted in level B PPE, including Saranex coveralls, disposable nitrile sampling gloves and rubber booties, and a self-contained breathing apparatus unit. Soil sampling will be conducted in level C Protection, including tyvek coveralls, disposable nitrile sampling gloves and rubber booties, and an air purifying respirator.

8. SAMPLE CONTAINER AND EQUIPMENT PREPARATION:

All sample containers will be specialty-cleaned laboratory glassware, as directed under OSWER Directive 9240.0-05: Specifications and Guidance for Obtaining Contaminant-Free Sample Containers (July 1989). The outside of the sample jars also will be wiped clean to prevent possible spread of contamination beyond the decontamination zone. Plain paper napkins will be utilized for the wipe-down process. Decontamination of sampling apparatus between sample locations is necessary since all sampling equipment is not disposable. If reuseable equipment, i.e. stainless steel trowels and mixing bowls, are used then the equipment will decontaminated between sampling locations as discussed below. Decontamination procedures in the field are in accordance with EPA sampling equipment decontamination SOP (See Appendix C) and will consist of the following:

i. Wash and scrub with low phosphate detergent;

ii. Deionized water rinse;

iii. Methanol rinse followed by hexane rinse;

iv. Deionized water rinse;

v. Air dry;

vi. Wrap in aluminum foil, shiny side out, for transport.

9. SAMPLE LABELING

Each sample will be accurately and completely identified. All labels will be moisture-resistant and able to withstand field conditions. Sample containers will be labeled prior to sample collection. The information on each label will include the following, but is not limited to:

i. Date/time of collection;

ii. Sample identity/location;

iii. Analysis requested.

10. SAMPLE CUSTODY PROCEDURES

EPA chain-of-custody records will be completed and maintained throughout the entire site activities as per TAT Standard Operating Procedures (SOP) on sample handling, sample container contract specifications, and EPA Laboratories SOP. The chain-of-custody form to be used lists the following information:

i. Sample number;

ii. Number of sample containers;

iii. Description of samples including specific location of sample collection;

iv. Identity of person collecting the sample;

v. Date and time of sample collection;

vi. Date and time of custody transfer to laboratory (if the sample was collected by a person other than laboratory personnel);

vii. Identity of person accepting custody (if the sample was collected by a person other than the laboratory personnel);

viii Identity of laboratory performing the analysis.

11. DOCUMENTATION, DATA REDUCTION, AND REPORTING

Field data will be entered into a bound notebook. Field notebooks, field data sheets, Chain-of-Custody forms, and laboratory analysis reports will be filed and stored per the TAT Document Control System.

12. QUALITY ASSURANCE AND DATA REPORTING

All sample analyses will be conducted using quality assurance level 2 (QA-2). The requirements for QA level 2 are:

i. Sample documentation;

ii. Chain of custody;

iii. Sample holding times;

iv. Field and trip blanks;

v. Initial and continuing instrument calibration;

vi. Detection limit should be determined, unless inappropriate.

13. DATA VALIDATION

All steps of data generation and handling will be evaluated by the On-Scene Coordinator (OSC), the Project Manager, and the Quality Assurance Officer for compliance with EPA Region II SOP for validating hazardous waste site data.

14. SYSTEM AUDIT

The Quality Assurance/Quality Control (QA/QC) Officer or a designated representative will observe the sampling operations and review subsequent analytical data to assure that the QA/QC project plan has been followed.

15. CORRECTIVE ACTION

All provisions will be taken in the field and laboratory to ensure that any problems that may develop will be dealt with as quickly as possible to ensure the continuity of the sampling program. Any deviations from this sampling plan will be noted in the final report.

16. REPORTS

Laboratory results and all requested QA/QC information will be submitted to EPA upon completion of sample analyses. Sampling reports will be issued after receipt of laboratory results.

17. PROJECT FISCAL INFORMATION

Sampling equipment and manpower shall be provided by the Technical Assistance Team (TAT). All man-hours expended by TAT will be charged to TDD # 02-9410-0090.

APPENDIX A

SOIL SAMPLING SOP

2.0 SOIL SAMPLING: SOP #2012

2.1 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to describe the procedures for collecting representative soil samples. Analysis of soil samples may determine whether concentrations of specific sod pollutants exceed established action levels, or if the concentrations of soil pollutants present a risk to public health, welfare, or the environment.

2.2 METHOD SUMMARY

Soil samples may be collected using a variety of methods and equipment. The methods and equipment used are dependent on the depth of the desired sample, the type of sample required (disturbed versus undisturbed), and the type of soil. Near-surface soils may be easily sampled using a spade, trowel, and scoop. Sampling at greater depths may be performed using a hand auger, a trier, a split-spoon, or, if required, a backhoe.

2.3 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Chemical preservation of solids is not generally recommended. Refrigeration to 4°C, supplemented by a minimal holding time, is usually the best approach.

2.4 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary interferences or potential problems associated with soil sampling. These include cross-contamination of samples and improper sample collection. Cross-contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, disturbance of the matrix resulting in compaction of the sample, or inadequate homogenization of the samples where required, resulting in variable, non-representative results.

2.5 EQUIPMENT/APPARATUS

- sampling plan
- maps/plot plan
- safety equipment, as specified in the health and safety plan
- compass
- tape measure
- survey stakes or flags
- camera and film
- stainless steel, plastic, or other appropriate homogenization bucket or bowl
- 1-quart mason jars w/Teflon liners
- Ziploc plastic bags
- logbook

- labels
- chain of custody forms and seals
- field data sheets
- cooler(s)
- ice
- decontamination supplies/equipment
- canvas or plastic sheet
- spade or shovel
- spatula
- scoop
- plastic or stainless steel spoons
- trowel
- continuous flight (screw) auger
- bucket auger
- post hole auger
- extension rods
- T-handle
- sampling trier
- thin-wall tube sampler
- Vehimeyer soil sampler outfit
  - tubes
  - points
  - drive head
  - drop hammer
  - puller jack and grip
- backhoe

2.6 REAGENTS

Reagents are not used for the preservation of soil samples. Decontamination solutions are specified in ERT SOP #2006, Sampling Equipment Decontamination.

2.7 PROCEDURES

2.7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are required.

2. Obtain necessary sampling and monitoring equipment.

3. Decontaminate or preclean equipment, and ensure that it is in working order.

4. Prepare schedules, and coordinate with staff, client, and regulatory agencies, if appropriate.

5. Perform a general site survey prior to site entry in accordance with the site-specific health and safety plan.

6. Use stakes, buoys, or flagging to identify and mark all sampling locations. Consider specific site factors,

including extent and nature of contaminant, when selecting sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations will be utility-cleared by the property owner prior to soil sampling.

2.7.2 Sample Collection

Surface Soil Samples

Collect samples from near-surface soil with tools such as spades, shovels, and scoops. Surface material can be removed to the required depth with this equipment, then a stainless steel or plastic scoop can be used to collect the sample.

This method can be used in most soil types but is limited to sampling near surface areas. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sampling team member. The use of a flat, pointed mason trowel to cut a block of the desired soil can be helpful when undisturbed profiles are required. A stainless steel scoop, lab spoon, or plastic spoon will suffice in most other applications. Avoid the use of devices plated with chrome or other materials. Plating is particularly common with garden implements such as potting trowels.

Follow these procedures to collect surface soil samples.

1. Carefully remove the top layer of soil or debris to the desired sample depth with a precleaned spade.

2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard a thin layer of soil from the area which came in contact with the spade.

3. If volatile organic analysis is to be performed, transfer a portion of the sample directly into an appropriate, labeled sample container(s) with a stainless steel lab spoon, plastic lab spoon, or equivalent and secure the cap(s) tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into an appropriate, labeled container(s) and secure the cap(s) tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled container(s) and secure the cap(s) tightly.

Sampling at Depth with Augers and Thin-Wall Tube Samplers

This system consists of an auger, a series of extensions, a "T" handle, and a thin-wall tube sampler (Appendix A, Figure 1). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger. If a core sample is to be collected, the auger tip is then replaced with a thinwall tube sampler. The system is then lowered down the borehole, and driven into the soil at the completion depth. The system is withdrawn and the core collected from the thin-wall tube sampler.

Several types of augers are available. These include: bucket, continuous flight (screw), and posthole augers. Bucket augers are better for direct sample recovery since they provide a large volume of sample in a short time. When continuous flight augers are used, the sample can be collected directly from the flights, which are usually at 5-feet intervals. The continuous flight augers are satisfactory for use when a composite of the complete soil column is desired. Posthole augers have limited utility for sample collection as they are designed to cut through fibrous, rooted, swampy soil.

Follow these procedures for collecting soil samples with the auger and a thin-wall tube sampler.

1. Attach the auger bit to a drill rod extension, and attach the 'T" handle to the drill rod.

2. Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first 3 to 6 inches of surface soil for an area approximately 6 inches in radius around the drilling location.

3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.

4. After reaching the desired depth, slowly and carefully remove the auger from boring. When sampling directly from the auger, collect sample after the auger is removed from boring and proceed to Step 10.

5. Remove auger tip from drill rods and replace with a pre-cleaned thin-wall tube sampler. Install proper cutting tip.

6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Care should be taken to avoid scraping the borehole sides. Avoid hammering the drill rods to facilitate coring as the vibrations may cause the boring walls to collapse.

7. Remove the tube sampler, and unscrew the drill rods.

8. Remove the cutting tip and the core from the device.

9. Discard the top of the core (approximately 1 inch), as this represents material collected before penetration of the layer of concern. Place the remaining core into the appropriate labeled sample container(s). Sample homogenization is not required.

10. If volatile organic analysis is to be performed, transfer a portion of the sample directly into an appropriate, labeled sample container(s) with a stainless steel lab spoon, plastic lab spoon, or equivalent and secure the cap(s) tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into an appropriate, labeled container(s) and secure the cap(s) tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into the appropriate, labeled container(s) and secure the cap(s) tightly.

11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the drill and assembly, and follow steps 3 through 11, making sure to decontaminate the auger and tube sampler between samples.

12. Abandon the hole according to applicable state regulations. Generally, shallow holes can simply be backfilled with the removed soil material.

Sampling at Depth with a Trier

The system consists of a trier, and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

Follow these procedures to collect soil samples with a sampling trier.

1. Insert the trier (Appendix A, Figure 2) into the material to be sampled at a (0° to 45° angle from horizontal. This orientation minimizes the spillage of sample.

2. Rotate the trier once or twice to cut a core of material.

3. Slowly withdraw the trier, making sure that the slot is facing upward.

4. If volatile organic analysis is to be performed, transfer a portion of the sample directly into an appropriate, labeled sample container(s) with a stainless steel lab spoon, plastic lab spoon, or equivalent and secure the cap(s) tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into an appropriate, labeled container(s) and secure the cap(s) tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into an appropriate, labeled container(s) and secure the cap(s) tightly.

Sampling at Depth with a Split Spoon (Barrel) Sampler

The procedure for split spoon sampling describes the collection and extraction of undisturbed soil cores of 18 or 24 inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted.

When split tube sampling is performed to gain geologic information, all work should be performed in accordance with ASTM D 1586-67 (reapproved 1974).

Follow these procedures for collecting soil samples with a split spoon.

1. Assemble the sampler by aligning both sides of the barrel and then screwing the bit onto the bottom and the heavier head piece onto the top.

2. Place the sampler in a perpendicular position on the sample material.

3. Using a sledge hammer or well ring, if available, drive the tube. Do not drive past the bottom of the head piece or compression of the sample will result.

4. Record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain this depth.

5. Withdraw the sampler, and open by unscrewing the bit and head and splitting the barrel. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in diameters of 2 and 3 1/2 inches. However, in order to obtain the required sample volume, use of a larger barrel may be required.

6. Without disturbing the core, transfer it to an appropriate labeled sample container(s) and seal tightly.

Test Pit/Trench Excavation

These relatively large excavations are used to remove sections of soil, when detailed examination of soil characteristics (horizontal structure, color, etc.) are required. It is the least cost effective sampling method due to the relatively high cost of backhoe operation.

Follow these procedures for collecting soil samples from test pit/trench excavations.

1. Prior to any excavation with a backhoe, it is important to ensure that all sampling locations are clear of utility fines and poles (subsurface as well as above surface).

2. Using the backhoe, dig a trench to approximately 3 feet in width and approximately 1 foot below the cleared sampling location. Place removed or excavated soils on plastic sheets. Trenches greater than 5 feet deep must be sloped or protected by a shoring system, as required by OSHA regulations.

3. Use a shovel to remove a 1- to 2-inch layer of soil from the vertical face of the pit where sampling is to be done.

4. Take samples using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.

5. If volatile organic analysis is to be performed, transfer a portion of the sample directly into an appropriate, labeled sample container(s) with a stainless steel lab spoon, plastic lab spoon, or equivalent and secure the cap(s) tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into an appropriate, labeled container(s) and secure the cap(s) tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled container(s) and secure the cap(s) tightly.

6. Abandon the pit or excavation according to applicable state regulations. Generally, shallow excavations can simply be backfilled with the removed soil material.

2.8 CALCULATIONS

This section is not applicable to this SOP.

2.9 QUALITY ASSURANCE/ QUALITY CONTROL

There are no specific quality assurance activities which apply to the implementation of these procedures. However, the following OA procedures apply:

- All data must be documented on field data sheets or within site logbooks.

- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior t o sampling/operation, and they must be documented.

2.10 DATA VALIDATION

This section is not applicable to this SOP.

2.11 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA, and specific health and safety procedures.

APPENDIX B

DRUM SAMPLING SOP

DRUM SAMPLING STANDARD OPERATION PROCEDURE

1.0 SCOPE AND APPLICATION

The purpose of this procedure is to provide technical guidance on implementing safe and cost-effective response actions applicable to hazardous waste sites containing drums. Container contents are sampled and characterized for disposal, bulking, recycling, grouping, and/or classification purposes.

2.0 METHOD SUMMARY

Prior to sampling, drums must be inventoried, staged, and opened. Inventory entails recording visual qualities of each drum and any characteristics pertinent to the contents' classification. Staging involves the organization, and sometimes consolidation of drums which have similar wastes or characteristics. Opening of closed drums can be performed manually or remotely. Remote drum opening is recommended for worker safety. The most widely used method of sampling a drum involves the use of a glass thief. This method is quick, simple, relatively inexpensive, and required no decontamination.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

- No preservatives shall be added to the sample
- Place sample container in two ziplock plastic bags
- Place each bagged container in a 1-gallon covered can containing absorbent packaging material. Place lid on can
- Mark the sample identification number on the outside of the can
- Place the marked cans in a cooler and fill remaining space with absorbent packing material
- Fill out chain of custody record for each cooler, place in plastic, and affix to inside of lid of the cooler
- Secure and custody seal the lid of the cooler
- Arrange for the appropriate transportation mode consistent with the type of hazardous waste involved

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

The practice of tapping drums to determine their contents is neither safe nor effective and should not be used if the drums are visually over pressurized or if shock-sensitive materials are suspected.

Drums that have been overpressurized to the extent that the head is swollen several inches above the level of the chime should not be moved. A number of devices have been developed for venting critically swollen drums. One method that has proven to be effective is a tube and spear device. A light aluminum tube (3 meters long) is positioned at the vapor space of the drum. A rigid, hooking device attached to the tube goes over the chime and holds the tube securely in place. The spear is inserted in the tube and positioned against the drum wall. A sharp blow on the end of the spear drives the sharpened tip through the drum and the gas vents along the grooves. The venting should be done from behind a wall or barricade. This device could be cheaply and easily designed and constructed where needed. Once the pressure has been relieved, the bung can be removed and the drum sampled.

5.0 EQUIPMENT/APPARATUS

The following are standard materials and equipment required for sampling:

- Health and Safety Plan
- Personnel protection equipment
- Wide-mouth glass jars with teflon cap liner, approximately 500 ml. volume
- Uniquely numbered sample identification labels with corresponding data sheets
- One-gallon covered cans half-filled with absorbent
- Chain of custody sheets
- Decontamination plan and materials
- Glass thieving tubes and materials
- Drum opening devices:

Bung Wrench

A common method for opening drums manually is using a universal bung wrench. These wrenches have fittings made to remove nearly all commonly encountered bungs. They are usually constructed of cast iron, brass, or a bronze-beryllium, non-sparking alloy formulated to reduce the likelihood of sparks.

The use of a "NON-SPARKING" wrench does not completely eliminate the possibility of a spark being produced.

Drum Deheader

One means be which a drum can be opened manually when a bung is not removable with a bung wrench is by using a drum deheader. This tool is constructed of forged steel with an alloy steel blade and is designed to cut the lid of a drum off or part way off by means of a scissors-like cutting action. A limitation of this device is that it can be attached only to closed head drums. Drums with removable heads must be opened by other means.

Backhoe Spike

The most common means used to open drums remotely for sampling is the use of a metal spike attached or welded to a backhoe bucket. In addition to being very efficient, this method can greatly reduce the likelihood of personnel exposure.

Hyradulic Drum Opener

Recently, remotely operated hydraulic devices have been fabricated to open drums remotely. One such device is discussed here. This device used hydraulic pressure to pierce through the wall of a drum. It consists of a manually operated pump which pressurize soil through a length of hydraulic line.

Pneumatic Devices

A pneumatic bung remover consists of a compressed air supply that is controlled by a heavy-duty, 2-stage regulator. A high pressure air line of desired length delivers compressed air to a pneumatic drill, which is adapted to turn a bung fitting selected to fit the bung to be removed. An adjustable bracketing system has been designed to position and align the pneumatic drill over the bung. This bracketing system must be attached to the drum before the drill can be operated. Once the bung has been loosened, the bracketing system must be removed before the drum can be sampled. This remote bung opener does not permit the slow venting of the container, and therefore appropriate precautions must be taken. It also requires the container to be upright and relatively level. Bungs that are rusted shut cannot be removed with this device.

6.0 REAGENTS

Decontamination of sampling equipment should follow site specific work plan.

7.0 PROCEDURE

7.1 Drum Staging

Prior to sampling, the drums should be staged to allow easy access. Ideally, the staging area should be located just far enough from the drum opening area to prevent a chain reaction if one drum should explode or catch fire when opened.

During staging, the drums should be physically separated into the following categories: those containing liquids, those containing solids, lab packs, gas cylinders, and those which are empty. This is done because the strategy for sampling and handling drums/containers in each of these categories will be different.

This may be achieved by:

- Visual inspection of the drum and its labels, codes, etc. Solids and sludges are typically disposed of in open top drums. Closed head drums with a bung opening generally contain liquid.
- Visual inspection of the contents of the drum during sampling, followed by restaging, if needed.

Once a drum has been excavated and any immediate hazard has been eliminated by overpacking or transferring the drum's contents, the drum is affixed with a numbered tag and transferred to a staging area. Color-coded tags, labels or bands should be used to mark similar waste types. A description of each drum, it's condition, any unusual marking, and the location where it was buried or stored are recorded on a drum data sheet. This data sheet becomes the principal recordkeeping tool for tracking the drum onsite.

Where there is good reason to suspect that drums containing radioactive, explosive, and shock-sensitive materials are present, these materials should be staged in a separate, isolated area. Placement of explosives and shock-sensitive materials in diked and fenced areas will minimize the hazard and the adverse effected of any premature detonation of explosives.

Where space allows, the drum opening area should be physically separated from the drum removal and drum staging operations. Drums are moved from the staging area to the drum opening area one at a time using forklift trucks equipped with drum grabbers or a barrel grappler. In a large-scale drum handling operation, drums may be conveyed to the drum opening area using a roller conveyer.

7.2 Drum Opening

There are three basic techniques available for opening drums at hazardous waste sites:

- Manual opening with nonsparking bung wrenches
- Drum deheading
- Remote drum puncturing or bung removal

The choice of drum opening techniques and accessories depends on the number of drums to be opened, their waste contents, and physical condition. Remote drum opening equipment should always be considered in order to protect worker safety. Under OSHA 1910.120, manual drum opening with bung wrenches or deheaders should be performed ONLY with structurally sound drums and waste contents that are known to be not shock sensitive, non-reactive, non-explosive, and non-flammable.

7.2.1 Manual Drum Opening

7.2.1.1 Bung Wrench

Manual drum opening with bung wrenches should not be performed unless the drums are structurally sound (no evidence of bulging or deformation) and their contents are known to be nonexplosive. If opening the drum with bung wrenches is deemed reasonable cost-effective and safe, then certain procedures should be implemented to minimize the hazard:

- Field personnel should be fully outfitted with protective gear
- Drums should be positioned upright with the bung up, or, for drums with bungs on the side, laid on their sides with the bung plugs up
- The wrenching motion should be a slow, steady pull across the drum. If the length of the bung wrench handle provides inadequate leverage for unscrewing the plug, a "cheater bar" can be attached to the handle to improve leverage.

7.2.1.2 Drum Deheading

Drums are opened with a drum deheader by first positioning the cutting edge just inside the top chime and then tightening the adjustment screw so the deheader is held against the side of the drum. Moving the handle of the deheader up and down while sliding the deheader along the chime will enable the entire top to be rapidly cut off if so desired. If the top chime of a drum has been damaged or badly dented it may not be possible to cut the entire top off. Since there is always the possibility that a drum may be under pressure, the initial cut should be made very slowly to allow for the gradual release of any built-up pressure. A safer technique would be to employ a remote method prior to using the deheader. Self-propelled drum openers which are either electrically or pneumatically driven are available and can be used for quicker and more efficient deheading.

7.2.2 Remote Opening

Remotely operated drum opening tools are the safest available means of drum opening. Remote drum opening is slow, but provides a high degree of safety compared to manual methods of opening.

7.2.2.1 Backhoe Spike

Drums should be "staged" or placed in rows with adequate aisle space to allow ease in backhoe maneuvering. Once staged, the drums can be quickly opened by punching a hole in the drum head or lid with the spike.

The spike should be decontaminated after each drum is opened to prevent cross contamination. Even though some splash or spray may occur when this method is used, the operator of the backhoe can be protected by mounting a large shatter-resistant shield in front of the operator's cage. This combined with the normal personal protection gear should be sufficient to protect the operator.

Additional respiratory protection can be afforded by providing the operator with an on-board airline system.

7.2.2.2 Hydraulic Devices

A piercing device with a metal point is attached to the end of a hydraulic line and is pushed into the drum by the hydraulic pressure. The piercing device can be attached so that a hole for sampling can be made in either the side or the head of the drum.

Some of the metal piercers are hollow or tube-like so that they can be left in place if desired and serve as a permanent tap or sampling port.

The piercer is designed to establish a tight seal after penetrating the container.

7.2.2.3 Pneumatic Devices

Pneumatically-operated devices utilizing compressed air have been designed to remove drum bungs remotely.

7.3 Drum Sampling

After the drum has been opened, preliminary monitoring of headspace gases should be performed using an explosimeter and organic vapor analyzer, In most cases it is impossible to observe the contents of these sealed or partially sealed vessels. Since some layering or stratification is likely in any solution left undisturbed over time, a sample must be taken that represents the entire depth of the vessel.

When sampling a previously sealed vessel, a check should be made for the presence of a bottom sludge. This is easily accomplished by measuring the depth to apparent bottom then comparing it to the known interior depth.

7.3.1 Glass Thief Sampler

The most widely used implement for sampling is a glass tube (Glass thief, 6mm to 16mm I.D. x 48 in. length). This tool is simple, cost effective, quick, and collects a sample without having to decontaminate.

Specific Sampling Procedure Using a Glass Thief

1. Remove cover from sample container.

2. Insert glass tubing almost to the bottom of the drum or until a solid layer is encountered. About 1 ft. of tubing should extend above the drum.

3. Allow the waste in the drum to reach its natural level in the tube.

4. Cap the top of the sampling tube with a tapered stopper or thumb, ensuring liquid with stopper.

5. Carefully remove the capped tube from the drum and insert the uncapped end in the sample container. Do not spill liquid on the outside of the sample container.

6. Release stopper and allow the glass thief to drain completely into the sample container. Fill the container to about 2/3 of capacity.

7. Remove tube from the sample container, break it into pieces and place the pieces in the drum.

8. Cap the sample container tightly and place prelabeled sample container in a carrier.

9. Replace the bung or place the pieces in the drum.

10. Transport sample to decontamination zone for preparation for transport to analytical laboratory.

In many instances a drum containing waste material will have a sludge layer on the bottom. Slow insertion of the sample tube down into this layer and then a gradual withdrawal will allow the sludge to act as a bottom plug to maintain the fluid in the tube. The plug can be gently removed and placed into the sample container by the use of a stainless steel lab spoon.

It should be noted that in some instances disposal of the tube by breaking it into the drum may interfere with eventual plans for the removal of its contents. The use of this technique should be cleared with the project officer or other disposal techniques evaluated.

7.3.2 COLIWASA Sampler

Designs exist for equipment that will collect a sample from the full depth of a drum and maintain it in the transfer tube until delivery to the sample bottle. These designs include primarily the Composite Liquid Waste Sampler (COLIWASA) and modifications thereof. The COLIWASA is a much cited sampler designed to permit representative sampling of multiphase wastes from drums and other containerized wastes. On configuration consists of a 152 cm by 4 cm I.D. section of tubing with a neoprene stopper at one end attached by a rod running the length of the rube to a locking mechanism opens and closes the sampler by raising and lowering the neoprene stopper.

The major drawbacks associated with using a COLIWASA concern decontamination and costs. The sampler is difficult if not impossible to decontaminate in the field and its high cost in relation to alternative procedures (glass tubes) make it an impractical throwaway item. It still has applications, however, especially in instances where a true representation of a multiphase waste is absolutely necessary.

Procedures for Use

1. Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.

2. Slowly lower the sampler into the liquid waste. (Lower the sampler at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sample tube is lower than that outside the sampler, the sampling rate is too fast and will result ia non-representative sample.)

3. When the sampler stopper hits the bottom of the waste container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.

4. Slowly withdraw the sample from the waste container with one hand while wiping the sampler tube with a disposable cloth or rag with the other hand.

5. Carefully discharge the sample into a suitable sample container by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in a sample container.

6. Cap the sample container with a Teflon-lined cap; attach label and seal; and record on sample data sheet.

7. Unscrew the T-handle of the sampler and disengage the locking block. Clean sampler.

8.0 CALCULATIONS

There are no specific calculations for these procedures.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

The following general quality assurance procedures apply:

1. All data must be documented on standard chain-of-custody forms, field data sheets, or within field/site log books.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

3. All deliverables will receive peer review prior to release.

The following specific quality assurance activity will apply:

Generally, one duplicate sample is collected for every ten samples collected. Other duplicates and spikes may be required depending on particular analytical parameter requested. See the site specific sampling plan for further QA/QC considerations.

10.0 DATA VALIDATION

The data generated will be reviewed according to the QA/QC considerations included in Section 9.0.

11.0 HEALTH AND SAFETY

The opening of closed containers is one of the most hazardous site activities. Maximum efforts should be made to ensure the safety of the sampling team. Proper protective equipment and a general awareness of the possible dangers will minimize the risk inherent to sampling operations. Employing proper drum opening techniques and equipment will also safeguard personnel. The use of remote sampling equipment whenever feasible is highly recommended.

Most drum sampling activities are performed in level B with additional splash protection. This includes:

- Protective coverall (saran Tyvek, PVC, acid suit, etc.)
- Hard hat
- SCBA
- Steel toe, steel shank boot (or latex booties covering steel tow work boots)
- Surgical gloves
- Solvent/acid resistant gloves
- Splash apron
- Face splash shield

APPENDIX C

SAMPLING EQUIPMENT DECONTAMINATION SOP

1.0 SAMPLING EQUIPMENT DECONTAMINATION: SOP #2006

1.1 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes methods used for preventing or reducing cross-contamination, and provides general guidelines for sampling equipment decontamination procedures at a hazardous waste site. Preventing or minimizing cross-contamination in sampled media and in samples is important for preventing the introduction of error into sampling results and for protecting the health and safety of site personnel.

Removing or neutralizing contaminants that have accumulated on sampling equipment ensures protection of personnel from permeating substances, reduces or eliminated transfer of contaminants to clean areas, prevents the mixing of incompatible substances, and minimizes the likelihood of sample cross-contamination.

1.2 METHOD SUMMARY

Contaminants can be physically removed from equipment, or deactivated by sterilization or disinfection. Gross contamination of equipment requires physical decontamination, including abrasive and non-abrasive methods. These include the use of brushes, air and wet blasting, and high-pressure water cleaning, followed by a wash/rinse process using appropriate cleaning solutions. Use of a solvent rinse is required when organic contamination is present.

1.3 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

This section is not applicable to this SOP.

1.4 INTERFERENCES AND POTENTIAL PROBLEMS

- The use of distilled/deionized water commonly available from commercial vendors may be acceptable for decontamination of sampling equipment provided that it has been verified by laboratory analysis to be analyte free.

- An untreated potable water supply is not an acceptable substitute for tap water. Tap water may be used from any municipal water treatment system for mixing of decontamination solutions.

- Acids and solvents utilized in the decontamination sequence pose the health and safety risks of inhalation or skin contact, and raise shipping concerns of permeation or degradation.

- The site work plan must address disposal of the spent decontamination solutions.

- Several procedures can be established to minimize contact with waste an the potential for contamination. For example:

  - Stress work practices that minimize contact with hazardous substances.

  - Use remote sampling, handling, and container-opening techniques when appropriate.

  - Cover monitoring and sampling equipment with protective material to minimize contamination.

  - Use disposable outer garments and disposable sampling equipment when appropriate.

1.5 EQUIPMENT/APPARATUS

- appropriate personal protective clothing
- non-phosphate detergent
- selected solvents
- long-handled brushes
- drop cloths/plastic sheeting
- trash container
- paper towels
- galvanized tubs or buckets
- tap water
- distilled/deionized water
- metal/plastic containers for storage and disposal contaminated wash solutions
- pressurized sprayers for tap and deionized/distilled water
- sprayers for solvents
- trash bags
- aluminum foil
- safety glasses or splash shield
- emergency eyewash bottle

1.6 REAGENTS

There are no reagents used in this procedure aside from the actual decontamination solutions and solvents. In general, the following solvents are utilized for decontamination purposes:

- 10% nitric acid [1]
- acetone (pesticide grade) [2]
- hexane (pesticide grade) [2]
- methanol

[1] Only if sample is to analyzed for trace metals.
[2] Only if sample is to analyzed for organics.

efficiency. Air blasting has several disadvantages: it is unable to control the amount of material removed, it can aerate contaminants, and it generates large amounts of waste.

- Wet Blasting: Wet blast cleaning, also used to clean large equipment, involves use of a suspended fine abrasive delivered by compressed air to the contaminated area. The amount of materials removed can be carefully controlled by using very fine abrasives. This method generates a large amount of waste.

Non-Abrasive Cleaning Methods

Non-abrasive cleaning methods work by forcing the contaminant off of a surface with pressure. In general, less of the equipment surface is removed using non-abrasive methods. The following non-abrasive methods are available:

- High-Pressure Water: This method consists of a high-pressure pump, an operator-controlled directional nozzle, and a high-pressure hose. Operating pressure usually ranges from 340 to 680 atmospheres (atm) which related to flow rate of 20 to 140 liters per minute.

- Ultra-High-Pressure Water: This system produces a pressurized water jet (from 1,000 to 4,000 atm). the ultra-high-pressure spray removes tightly-adhered surface film. The water velocity ranges from 500 m/sec (1,000 atm) to 900 m/sec (4,000 atm). Additives can enhance the method. this method is not applicable for hand-held sampling equipment.

Disinfection/Rinse Methods

- Disinfection: Disinfectants are a practical means of inactivating infectious agents.

- Sterilization: Standard sterilization methods involve heating the equipment. Sterilization is impractical for large equipment.

- Rinsing: Rinsing removes contaminants through dilution, physical attraction, and solubilization.

1.7.2 Field Sampling Equipment Cleaning Procedures

Solvent rinses are not necessarily required when organics are not a contaminant of concern and may eliminated from the sequence specified below. Similarly, an acid rinse is not required if analysis does not include inorganics.

1. Where applicable, follow physical removal procedures specified in section 1.7.1.

2. Wash equipment with a non-phosphate detergent solution.

3. Rinse with tap water.

4. Rinse with distilled/deionized water.

5. Rinse with 10% nitric acid if the sample will be analyzed for trace organics.

6. Rinse with distilled/deionized water.

7. Use a solvent rinse (pesticide grade) if the sample will be analyzed for organics.

8. Air dry the equipment completely.

9. Rinse again with distilled/deionized water.

Selection of the solvent for use in the decontamination process is based on the contaminant present at the site. Use of a solvent is required when organic contamination is present on-site. Typical solvents used for removal of organic contaminants include acetone, hexane, or water. An acid rinse step is required if metals are present on site. If a particular contaminant fraction is not present at the site, the nine-step decontamination procedure listed above may be modified for site specificity. The decontamination solvent used should not be among the contaminants of concern at the site.

Table 1 lists solvent rinses which may be required for elimination of particular chemicals. After each solvent rinse, the equipment should be air dried and rinsed with distilled/deionized water.

Sampling equipment that required the use of plastic tubing should be disassembled and the tubing replaced with clean tubing, before commencement of sampling and between sampling locations.

1.8 CALCULATIONS

This section is not applicable to this SOP.

1.9 QUALITY ASSURANCE/QUALITY CONTROL

One type of quality control sample specific to the field decontamination process is the rinsate blank. The rinsate blank provides information on the effectiveness of the decontamination process employed in the field. When used in conjunction with field blanks and trip blanks, a rinsate blank can detect contamination during sample handling, storage and sample transportation to the laboratory.

Table 1: Recommended Solvent Rinse for Soluble Contaminants

SOLVENT	SOLUBLE CONTAMINANTS
Water	• Low-chain hydrocarbons • Inorganic compounds • Salts • Some organic acids and other polar compounds
Dilute Acids	• Basic (caustic) compounds • Amines • Hydrazines
Dilute Bases--for example, detergent and soap	• Metals • Acidic compounds • Phenol • Thiols • Some nitro and sulfonic compounds
Organic Solvents (1) - for example, alcohols, ethers, ketones, aromatics, straight-chain alkanes (e.g., hexane), and common petroleum products (e.g.,fuel, oil, kerosene)	• Nonpolar compounds (e.g., some organic compounds)

(1)- WARNING: Some organic solvents can permeate and/or degrade protective clothing.

A rinsate blank consists of a sample of analyte-free (i.e., deionized) water which is passed over and through a field decontaminated sampling device and placed in a clean sample container.

Rinsate blanks should be run for all parameters of interest at a rate of 1 per 20 for each parameter, even if samples are not shipped that day. Rinsate blanks are not required if dedicated sampling equipment is used.

1.10 DATA VALIDATION

This section is not applicable to this SOP.

1.11 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and specific health and safety procedures.

Decontamination can pose hazards under certain circumstances even though performed to protect health and safety. Hazardous substances may be incompatible with decontamination methods. For example, the decontamination solution or solvent may react with contaminants to produce heat, explosion, or toxic products. Decontamination methods may be incompatible with clothing or equipment; some solvents can permeate or degrade protective clothing. Also, decontamination solution and solvents may pose a direct health hazard to workers through inhalation or skin contact, or if they combust.

The decontamination solutions and solvents must be determined to be compatible before use. Any method that permeates, degrades, or damages personal protective equipment should not be used. If decontamination methods pose a direct health hazard, measures should be taken to protect personnel or the methods should be modified to eliminate the hazard.